THE TECH

GENERAL INSTITUTE ISSUE

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PROSPECT AND STATUS OF INSTITUTE ATHLETICS

Sane Development Has Lead To Recognition Of Worth

By MAJ. F. H. BRIGGS

The past season a distinct advance has been made in Athletics at the Institute. The feeling of other colleges certainly is that we are on a higher plane than heretofore, and our membership in the I. C. A. A. A. A., coupled with the success of our Cross Country Team at the Annual Run, has done much to augment this.

I do not think that there are other sports than those which are now undertaken which could be carried on successfully at the Institute.

Football is almost out of the question, as men cannot practise advantageously as a team during October, sufficiently to compete with colleges on a par with ourselves in other lines of athletics. In other colleges the football team meets every day from the middle of September up to the latter part of November and practises every afternoon from two or three o'clock until dark. The impossibility of indulging in such practise at the M. I. T. practically bars us from undertaking to have a good team.

Track Athletics, and the sports incident to Field Day, are about all that we can safely undertake during the autumn without incurring dissatisfaction from the Faculty as to our athletic methods, which under present conditions have its sympathy and approval.

In winter sports, Hockey and Basket Ball have shown themselves to be worthy of continuance in the future, and now all that remains is to produce strong teams. Basket Ball, however, is looked upon in intercollegiate circles as rather a waning sport, and year by year one or more colleges drop out of the ring.

The co-operation established between the gymnastic and athletic interests during the past season has shown good results, and it is hoped that another year still greater advance may be made in this direction.

In the spring, Track Athletics are at their height, and the undergraduates can well look with pride on their progress in this line during the past few years.

The Lawn Tennis men have always supported this game very effectively and are worthy of greater recognition.

The Crew may be considered as being in an embryonic condition. If the results of the next two or three years show this interest well supported, and financially able to continue without aid fro mthe M. I. T. A. A., it will undoubtedly be placed in the same category as Hockey and Basket Ball, which have undergone a similar experience.

We are, however, in my opinion, at a disadvantage compared with other colleges in attempting to have a crew or base ball nine. There is hardly another college in the country which closes its doors early in June and where the preparation for examinations begins by the middle of May. Subsequent to the middle of May is really the period when the crews and base ball nine of other colleges are in the later stages of development, whereas, at the Institute the season will just now be ended. It is hoped, however, that the crew will have better opportunities for competition in subsequent years.

Intra-Mural relations have been steadily augmenting from year to year, and it is particularly this line which the Corporation and Faculty wish to see developed to even a greater extent than

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THE INSTITUTE A TRAINING GROUND FOR A LIFE OF ENERGY AND USEFULNESS

The Scheme Of Instruction Is Not To Make Finished Engineers But To Start Men On Road To Success

Note:—This article is the result of interviews, suggestions and aid from men interested in various departments of the Institute. It is not intended to bring out new ideas but rather to collect and expound the principles of instruction that has been laid down from time to time by the men who have guided the Institute in the development of the educational policy.

"I am sure that I speak from no impulse of mere enthusiasm when I say that this new undertaking presents an opportunity of practical beneficience in connection with education which is not only peculiar but without precedent in this country. My experience as a teacher and my reflection on the needs and means of industrial instruction assure me that this enterprise, when truly understood must command the liberal sympathy of those who aim to make their generosity fruitful in substantial and enduring public good" .....William B. Rogers.

The energies and powers of this one man started the movement that produced the Massachusetts Institute of Technology chiefly known through its activities as a School of Applied Science. Its development has been characterized by the elimination of the least important of the branches, as for example the Industrial Museum to make way for the more directly useful as the School of Applied Science.

Today, the Institute is turning out graduates from fourteen separate courses. With so many diffenert branches it seems improbable that they can all be thoroughly successful. That such is the case is due to the underlying scheme of instruction common to all courses.

In breaking away from the so called classical scheme, the Institute did not adopt a narrower principle of specific details. It did not turn away from culture but sought to risk it by developing an appreciation of the principles of science and inspiring a zeal for their application to human nature, as well as to those practical problems of daily life which necessarily have an intense human interest. Therefore we find coupled, with the investigations into nature's laws, investigations of a general nature in economics, history, and languages. These are called general studies in contradistinction to "professional studies. But it must be realized that they are all "professional" even though they may not adapt themselves to the immediate consideration of employment after graduation.

Realizing that all real development proceeds more or less along these same lines, the first two years are taken up by all in the same manner. The first idea of developing a productive engineer is that he may conceive ideas. That is, he must be able to see a thing before he grasps it. Descriptive geometry we find as the recognition of this principle. Elsewhere, this subject has been taught by theorem and corallary as a pure feat of mental memory. Here, the idea is to prove the points by "visualizing."

The next point is the expression of ideas. An idea is worthless unless it can be communicated. This is not a one man world. It takes the co-operation of the many grouped around a common idea to produce a result. The first means of expression, is of course language. English therefore, is taught largely from a utilitarian standpoint. To be clear, concise, accurate, and effective are the ideals. Still, there is the further idea of the appreciation of the work of others, the best examples of course being the broadening masterpieces of literature. The study of other modern languages at the Institute are of first importance as a direct aid to English and the varies shadings of its meanings. Then, of course, comes the consideration, that not all people can understand or give us ideas in English. So that rather than get the ideas second hand the modern virile languages are studied to aid in cosmopolitan relations of study and business. The latter consideration is of particular importance in the opening up of commerce via the Panama Canal to the Spanish speaking or South American countries.

Physical training and military science must not be overlooked. Both are required in the freshman year. The former may be work in the gymnasium, or on the track, and recently, on the crew. Physical training goes hand in hand with mental training. The drill gives physical training also, but its main usefulness is in teaching to serve. The needs of the body, politic are also forwarded by the realization that the time may come when service to State or country must not find the reserve militia unprepared.

Another important means of expression, particularly for the engineer, is drawing, neatness and arrangement are here the prime considerations. In free hand, lettering is particularly emphasised and second because proportion can be learned from free hand letters which are not made by rule as by copying any other objects.

History is given with an idea of explaining past events in as much as they bear on the affairs of the day. By knowledge of what has gone before we are best able to judge of what results will follow our endeavors. Moreover, it gives great moral stamina to look back upon results achieved against great obstacles by the untiring energy of individuals.

Economics and business law show the relations of the endeavors of the individual to the good of the whole. Co-operation is again emphasized. "The engineers is the man who for one dollar does what any fool can do for two." The value of operations as well as the operations themselves are to be considered.

Aside from the broadening, these general subjects give the culture that makes a man, one who can get along better and consequently accomplish more with his associates.

Besides these studies, there are others of a more strictly utilatarian nature still taken by the majority. These are mathermatics, physics, and chemistry.

The mathematical department has initiated a movement by the blending of the old divisions of College Algebra, Analytical Geometry, Calculus, and Differential Equations into one homogeneous course. The various phases are all treated, but their association with one another is constantly emphasized. This centralization has very beneficial effects on the student who can thereby easily get a comprehensive idea of the whole subject. The classes are small so that the individual can be given proper attention.

Chemistry is taught to all in the first year. It is the first subject giving an idea of the laws of nature. Its most closely allied subject is physics which is being more and more introduced into the courses in the second year. The now common laboratory method of instruction, inaugurated in this country by the Institute plays a very large part in these subjects. But it has never been carried to the extreme that would mean the sac-

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THE ORGANIZATION OF THE INSTITUTE

Relations Of Corporation, Faculty, Administration and Students

By PROF. H. W. TYLER

As Gaul was formerly divided into three parts, and as modern government is separated into the legislative, executive, and judicial divisions, so in the Institute we may differentiate the fundamental activities as educational, administrative, and financial. The last term is naturally too narrow for accuracy. From another point of view, the Institute is a great industrial establishment, of which entering students are the raw material, trained graduates the finished product, Corporation and Faculty, the personel. The establishment is however run at a financial loss and must depend to a large extent on philanthropic support. The contrasts in this comparison are more marked and more important than the resemblances. Legally, the Institute is a corporation, authorized by the state to hold property for educational purposes, to carry on education, and to confer degrees. The corporation thus established consists of a president, of three representatives of the state, of not more than thirty-five life members, including the treasurer aid the secretary, and of fifteen term members representing the alumni. The first term-members were elected in 1906. The alumni present each year five names to the Corporation, of whom three are elected for a term of five years. They are not eligible on retirement for immediate re-election.

The Corporation holds four stated meetings annually, but conducts most of its work through five standing committees and twelve visiting committees on the various departments of instruction.

Of the standing committees, the Executive Committee is by far the most important. Meeting ordinarily twice each month during the school year, and at times more frequently, it transacts nearly all the general business of the Institute, including such matters as appointments of officers of administration and instruction, determination of salaries and appropriations, etc. Initiative is also taken by this committee in the decision of such questions as the establishment of new departments, the erection of buildings, etc. The President and Treasurer are ex-officio members of the committee, and the other members are elected in rotation for five-year terms. The present committee includes three graduates of the Institute: Mr. W. B. Thurber, the Treasurer, '89 Mr. C. A. Stone, '88, and Mr. Frederick W. Wood, a term member, '77.

The other standing committees deal with Finance, Society of Arts, Auditing, and Nominations.

The administrative staff of the Institute consists of the President, and, on the educational side, of the Chairman of the Faculty, the Dean, the Secretary of the Faculty, the Registrar, and the Recorder; on the business side, the Bursar, the Librarian, and the President's Assistant. There is naturally also a large staff of clerical and other assistants, of janitors, carpenters, machinists, etc., the total number of such employees being at present about 125.

The work for which all this machinery exists is that of teaching and investigation, the rest is merely a means to this end.

The instructing staff consists of 44 professors, 14 associate professors, 32 assistant professors, 69 intructors, 51 assistants, and 18 lecturers.

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RESEARCH WORK IN THEORETICAL CHEMISTRY

By PROF A. A. NOYES

The primary purposes of this Laboratory are to afford opportunities for the pursuit of advanced studies in theoretical and physical chemistry and for the carrying on of researches in these subjects. During the past year thirteen men, including four candidates for the Ph. D. degree, have been working in the laboratory upon such researches.

One of the main lines of work is the continuation of the research upon the properties of salt solutions in relation to the Ionic Theory, which, with the view of developing that theory, has been in progress for a number of years under the direction of Prof. A. A. Noyes. The special subjects at present under investigation are: (1) the transference numbers of tri-ionic salts by Dr. K. G. Falk, with the purpose of determining intermediate whether irons, such as KSO4 or PbNO3, exist in considerable quantity; (2) the conductivity of mixtures of salts, by Mr. A. C. Melcher, Dr. W. C. Bray, and Mr. F. L. Hunt, with the purpose of establishing the general law of the ionization of salts; and (3) the solubility of salts in the presence of other salts, by Dr. W. D. Harkins, with the purpose of determining empirically the form of the law of solubility effect which must be substituted for the inexact mass-action form of that law. This line of research has again been aided on the financial side by a grant of $3000 made to Prof. A. A. Noyes by the Carnegie Institution of Washington.

Another of the main lines of recearch in the laboratory, which is being carried out by graduate students under the direction of Prof. G. N. Lewis, is the experimental determination and computation of a system of values for the free energy of chemical substances analogous to the system of values for the total energy previously developed by thermochemical investigators. The problem is one of fundamental importance to the science of chemistry, since from the free-energy data for the substances the equilibrium of the chemical reactions in which they are involved can be computed. The special reactions now being studied in this direction are: (1) that between sulphur and water, producing sulphur dioxide and hydrogen sulphide, by Mr. Merle Randall; (2) that between nitric oxide, nitric acid, and water, producing nitrous acid, by Mr. Arthur Edgar; and (3) that between chlorine gas and chloride-ion in aqueous solution, studied by electromotive force measurements, by Mr. F. F. Rupert.

Dr. W. C. Bray has continued the studies of the equilibrium of some chemical reactions begun a few days ago in this laboratory by Mr. G. M. J. Mackay; namely, of those between solid cupric iodide, iodine, and cupric ioldine in solution, between potassium iodide and polyiodide in solution, and between iodine and water.

During the past year articles describing theoretical studies upon the newly developed Principle of Relativity have been published by Prof. G. N. Lewis and by Mr. R. C. Tolman; and an article upon the quantitative application of the theory of indicators to volumetric analysis has been prepared by Prof. A. A. Noyes. An experimental study of indicators from this standpoint has been undertaken by Prof. M. S. Sherrill and Mr. L. Rosenstein.

THE INSTITUTE AS A BUSINESS PROPOSITION

By F. H. RAND

It may be interesting to your readers to see in concrete form some figures from the Institute Treasurer's Report for the last fiscal year.

The total income for the year ending September 30, 1909, aside from special bequests totalled $545,974.84 and the total expense for the same period was $575,794.35 the excess of current expenses over current income being $29,819.51.

Briefly the income is made up as follows:

Tuition,	$325,434.25
Laboratory Fees, etc.,	15,761.29
Income from former gifts for General Purposes,	79,958.47
Grants from the State and United States,	47,643.01
Gifts from the Alumni under the five-year agreement,	41,147.94
Gifts for designated purposes,	16,201.10
Income from rents, interest, discounts and refunds,	19,828.78
	$545,974.84

Expenses:

Salaries and wages accessory to teaching,	$347,704.79
Administration and Gen. Ex.,	110,769.02
Operation and Maintenance of Plant,	89,943.88
Expenditure Special Dept., Funds, etc.,	27,376.66
	$575,794.35

It will be seen from these figures that of the total expense of maintaining the Institute ($575,794.35) the students paid tuition and laboratory fees ($341,195.54). This will give some idea of the proportion the students pay in relation to the expense of the service rendered by the Institute.

The total resources of the Institute amount to (September 30, 1909):

Land, Buildings and Equipment,	$1,871,538.65
Notes and Checks receivable,	19,253.97
Stocks and Bonds,	1,972,673.75
Cash on Hand,	82,880.19
	$3,946,346.56

And in addition to the above, the Treasurer holds in trust for the Alumni Association, the Walker Memorial Fund, amounting to $120,796.97.

During the past year the Institute has received from friends for general and special purpose, in cash, $75,888.04. A comparison of the figures given above with those of 1884 just twenty-five years ago, is interesting.

In that year the students' fees amounted to $94,119.35. Current expenses were $164,095.44 and the Treasurer's Report shows this item: Cash overdrawn during the year, $89,205.91. The number of students that year was 579 as against 1462 the past year.

It may be added that the Institute gives directly or indirectly in scholarships approximately $32,875.

It is also of interest to note that it costs the Institute $400.68 per student last year, while the tuition fee is $250.

INSTITUTE ACTIVITIES ROUND OUT TRAINING

Give Many Good Points In Relations Of Men To Men

By DUDLEY CLAPP

Student activities play an extremely important part in the undergraduate life at Technology, more so perhaps than in any similar institution, due to the fact that there are no dormitories. Situated as Tech is, the societies, teams, and other organizations are the only means students have for congregating and enjoying the "college life" which is considered such an essential feature of higher education.

Mr. Whitney, factory manager for the Welsbach Co., in a recent talk on factory management, commended college men particulary because, as he said, "if you tell a college man he's a chump he'l believe you," while other men do not take kindly to correction and have to be handled with gloves. While this may be in a degree the result of greater knowledge and a wider view, it is also quite largely the result of the training outside of the class room. A college student is often corrected and has occasion in his upper class experience to correct others, so that he realizes that the best men are open to criticism and are benefited by it.

Thus, one of the most striking advantages gained by the college man is obtained outside of his curriculum. At the Institute, the activties supply this feature of college training. They are, moreover, on a particularly democratic basis here, and there is little "wire-pulling" in getting offices. They have developed sanely with the idea of the greatest good for the greatest number, and, with the point system in working order, there is little necessity for anyone to be overburdened with outside work to the exclusion of studies.

A comparison of the activities on a basis of merit would be as odious as futile. The one which first suggests itself as an opening for anyone who care to go out is The Tech. With its many departments, there is room for a large number of men, and there is good experience to be obtained in each department. The practical training in the use of English is, perhaps, the most obvious advantage, and the training in management, particularly for those "high up" is also apparent. Not the least benefit to be derived from the paper is the opportunity to keep in touch with everything at the Institute. There is a good deal of satisfaction in knowing everything that has happene and is going to happen.

A former member of "The Tech can look back upon his experiences in the "good old" days when the editor-in-chief and the managing editor practically wrote the paper themselves and then went down to the printers and worked until the "wee sma' hours" three times a week. It is also a matter of pride to recall the special issue on Dr. Maclaurin's election when two of the editors set up the "heads" themselves, borrowed a cut from the Boston Post at 3.00 A. M., after that paper had gone to press, and then stayed until seven o'clcok when the force came on to print the paper. Those days of late hours, strange experience and flunks are largely passed, and the present management has systematized the work and divided it among the departments so that no one can now, with any reason, whisper The Tech in Registrar Humphreys' ear.

The largest activity at the Institute is the Show. Undergraduate in all its departments, it interests in many different lines. Bookwriters, lyric writers, composers, artists, singers, actors, dances, all are welcomed, while the management offers experience in the line of newspaper work, advertising, business, stage, and executive management. The object is "to promote good fellowship and student relations at the Institute and to bring together on a democratic basis men of all classes. The hundred odd men connected with the production get together and learn to know each other, forming some of the pleasantest associations in their course. The second object is to help athletics.

Technique combines much of the practice in writing and getting information of "The Tech" with the business training and experience. It is perhaps the most lasting testimonial to the undergraduate life at Technology and gives outsiders an insight into the activities here. The musical clubs, with their sixty odd members have been more important this year than ever before on account of the western trip which did much to advertise Technology.

The Institute Committee is a body whose nominal powers it is easy to state, and whose actual powers are more difficult to enumerate. A few years ago there appeared annually in The Tech the notice of an important meeting of the Institute Committee to have the picture taken. Largely through the effort of one Henry William Hoole, editor-in-chief of "The Tech" in 1907-08, this body was aroused from its lethargy. This year it has been more active than ever before, the monthly meetings having been chang to fortnightly and carried through in a business-like manner. All matters of importance have first been sifted down by the executive committee, and then presented to the main body. The point system has occupied considerable time as well as the question of Institute mail, bulletin boards, and other routine work, but numerous other questions of more or less importance have come up from time to time and been discussed.

A movement was started early in the year to centralize the activities, the particular aim being to look after the financial end and to see that the credit of Technology was upheld. It has so frequently been found by students approaching a firm for advertising or for some contract that the firm had been badly treated by some other Technology organization and had formed an opinion of Tech from this. The movement finally culminated in a meeting of the business and executive heads of the leading actvities and the election of an alumni advisory council to look over reports which must be submitted monthly by each organization.

Other activities at the Institute include athletics, which have been taken up in another article, the professional societies, the wireless and aero clubs, the various state and school clubs beside the secret societies. It is a singular fact which is noted by all who follow Tthe Tech, Technique, the Show, the musical clubs, etc., that there is a certain crowd of students, technically known as the "live ones," who take an interest in all of these, and there is a certain crowd who take no interest in anything. Those who do take an interest in undergraduate affairs cherisl the fond belief that they are doing a good deal for the Institute as well as themselves in forwarding the activities.

DUDLEY CLAPP.

SANITARY RESEARCH

By C. F. A. WINSLOW

The Sanitary Research Laboratory and Sewage Experiment Station was founded in 1902 by an anonymous donor for the purpose of making experiments on sewage purification and other sanitary problems and of disseminating a general knowledge of the results of sanitary research. The work was carried on for six years at an experiment station on Albany Street. and for the last twelve months a new and larger plant has been in operation at Old Harbor Point in Dorchester. Five volumes of Contributions have been published and distributed.

The central problem of the station has been the purification of the sewage of the South Metropolitan District of Boston which must ultimately be called for in view of the unsatisfactory working of the present Moon Island outfall. A general plan of treatment by means of trickling filters with subsequent sedimentation and disinfection of the effluent was worked out and published in 1907.

In the course of these, and later experiments, light has been thrown on many points of general interest in regard to the chemical and bacteriological examination of sewage and in regard to the engineering details of sewage purification. The system of Gravity Distribution for applying sewage to trickling filters, devised at the Albany Street station has been adopted by many plants, the largest being at Mt. Vernon, N. Y., now just completed.

The most important single contribution of the laboratory to current practise is undoubtedly the demonstation by Prof. Phelps of the efficiency and economy of sewage disinfection by the use of bleaching powder. The adoption of this method enabled the engineers in charge of sewage disposal at Baltimore to reduce their preliminary estimates by a million dollars, and the procedure promises to come into general use wherever local conditions call for an effluent of high bacterial purity.

Aside from studies of sewage disposal proper, the members of the staff of the research laboratory have conducted investigations in regard to the utilization of polluting industrial wastes like those from strawboard and sulphite mills and in regard to the disinfectant action of acids and of copper salts. The last volume of contributions contains a somewhat exhaustive study of the possible spread of bacteria in sewer air carried out in co-operation with the National Association of Master Plumbers.

Still more recently the scope of the laboratory has been further broadened to include an investigation of sanitary conditions in the granite cutting industry, which it is hoped may lead ultimately to a comprehensive study of the important problems of industrial hygiene.

DARTMOUTH WINS BY 2-3 OF A POINT FROM BOWDOIN

Result Undecided Until Last Event---Colbath of Bowdoin, Holman of Dartmouth And Roberts of Amherst High-Point Winners---Tech Makes Poor Showing

Events	D.	Bo.	Wes.	A.	W.	M.I.T.	Vt.	Me.	W.P.I.	Br.	Tu.	Tr.	C.	H.C.
100-Yard Dash	1	0	3	7	0	0	0	0	0	0	0	0	0	0
220-Yard Dash	0	0	7	1	0	3	0	0	0	0	0	0	0	0
440-Yard Run	0	0	2	5	3	1	0	0	0	0	0	0	0	0
880-Yard Run	5	0	0	0	1	3	0	2	0	0	0	0	0	0
Mile Run	0	5	0	0	1	0	0	5	0	0	0	0	0	0
Two-Mile Run	0	5	0	0	1	3	0	0	0	2	0	0	0	0
120-Yard Hurdles	0	0	5	0	3	2	0	0	0	1	0	0	0	0
220-Yard Hurdles	0	5	0	3	0	0	2	0	0	1	0	0	0	0
High Jump	5 3-4	3-4	0	0	3	0	0	0	0	3-4	0	0	3-4	0
Broad Jump	1	2	0	3	0	0	5	0	0	0	0	0	0	0
Pole Vault	8	1-3	0	1-3	0	0	0	0	0	0	0	2	1-3	0
Shot Put	2	0	1	0	3	0	0	0	5	0	0	0	0	0
Hammer Throw	3	8	0	0	0	0	0	0	0	0	0	0	0	0
Discus Throw	1	0	5	0	2	0	0	0	0	0	3	0	0	0
Totals	26 3-4	26 1-12	23	19 1-3	17	12	7	7	5	4 3-4	3	2	1 1-12	0

Dartmouth won the championship in the New England intercollegiate track meet at Tech Field Saturday afternoon, with the score of 26 3-4 points, a margin of two-thirds of a point over Bowdoin. Before the last event, the discus throw, Bowdoin led by one-third of a point; Bowdoin had no men in this event, while Dartmouth had only one, Lovejoy. By taking fourth place, counting one point, Lovejoy gave the victory to the Hanover team.

Close to Dartmouth with 26 3-4 point came Bowdoin with 26 1-12. Wesleyan scored 23, Amherst 19 1-3, Williams 17, Tech 12, Vermont 7, Maine 7, Worcester Polytechnic 5, Brown 4 3-4, Tufts 3, Trinity 2, and Colby 1 1-12. Holy Cross failed to score. Dartmouth's score was the result of her work in the field events, where the Green showed up strong, taking 20 3-4 points. Bowdoin took three firsts on the track, and one in the field event. Several other places in these events added to their score. Wesleyan showed up better than was expected and captured three firsts, one second, two thirds, and a fourth.

At the end of Friday's preliminary work it was evident that Dartmouth would be among the leaders in the finals. Seventeen Hanover men qualified, nearly twice as many as any other college. The other colleges scored as follows: Wiliams 9, Weseyan 8, Bowdoin 7, Tech 5, Amherst 5, Brown 4, Maine 3, Colby 3, Vermont 2, Worcester Polytech 2, Holy Cross, Tufts and Trinity each one. Technology's men proved somewhat of a disappointment. W. D Allen 1911, failed to qualify in the pole vault, P. W. Dalrymple 1912, did not quaify in the high jump, and J. L. Bray 1912 failed in the hammer throw. W. C. Salisbury 1911, qualified in the 220-yd. dash and in the quarter mile. P .D. White 1911 won his heat from Baxter of Dartmouth. W. J. Pearl 1910 took his first heat in the high hurdles from Marble of Brown. O. V. Chamberlain 1911, barely qualified in the discus throw.

Weather conditions on Saturday were of, the worst, and the track, although in better shape than on Friday, was much against fast times. However, three of the Tech field track records went by the board. Baxter of Dartmouth lowered the track record in the half-mile to 2m. 1 3-5s.; Colbath of Bowdoin did the mile in 4m. 27 3-5s. and the two-mile in 9m. 56 1-5s., both being new track records. Holdman of Dartmouth established a new N. E. I. A. A. record in the pole vault of 11 ft. 8 1-2 in. Colbath of Bowdoin, the winner of both the mile and the two-mile runs, Holdman of Dartmouth, who now holds the N. E. I. A. A. pole vault record, and Roberts of Amherst, the greatest point winner, were the stars of the meet.

DASHES.

All of the best men remained for the finals of the 100-yd. dash. Sherman of Dartmouth did not start. Either Roberts of Amherst or Robson of Wesleyan was expected to win the event. McKenney of Bowdoin, Russell of Dartmouth, Snow of Williams and Baldwin of Amherst also started. The men all started with the crack of the gun, but Roberts and Robson soon pulled slightly ahead, the Amherst man placing first with Robson at his shoulder. Baldwin was third, and Russell was awarded fourth place. The time was 10 2-5 sec.

In the final of the furlong dash, Salisbury of Tech started in the rear with Robson of Wesleyan, Baldwin of Amherst, Wood of Wesleyan, Russell of Dartmouth and Hartigan of Brown, ahead of him. He seemed to be out o the running, but in the last fifteen yards, he came up with a rush and the whole six men were nearly even, Salisbury throwing himself forward into second place at the tape. Robson was awarded first place, Wood of Wesleyan was third, and Baldwin of Amherst was decided upon by the judges as fourth man. Robson finished in 22 4-sec.

DISTANCE RUNS.

Salisbury of Tech started out in the quarter in the lead with Young of Amherst, Lester of Wesleyan, McKenna of Holy Cross and Palmer of Dartmouth close at his heels. He kept in this place past the turn, but in the finishinn sprint Young, Lester, and Wood passed him. Young won in 51 seconds from Lester who was about a yard behind him. Wood was third and Salisbury fourth.

Baxter of Dartmouth and White of Technology were looked upon as the chief contenders in the half-mile. In the preliminary heat, White just beat out Baxtee for first place. In the final, White had the pole, and soon darted to the front, doing the quarter mile in 59 seconds. Baxter was holding himself back during the first lap, but after passing the quarter, he came to the lead with a rush, passed White and crossed the tape a winner by 10 yards. White came secodn, with a good lead over Fortier of Maine. Campbell of Williams landed in the fourth position. Baxter's time was 2 minutes, 1 3-5 sec.

From a crowded field L. O. Mills 1911 of Technology sprang into the lead in the mile run. For half the race, Mills was doing the pacing with Colbath of Bowdoin and Harmon and Hicks of Maine following close behind. After the third lap, the Maine men jumped ahead leaving Mills way behind. Colbath beat out Harmon by 20 yards in 4 minutes 27 3-5 seconds. Hicks captured third after a tussle with Newton of Williams who landed fourth.

H. G. Watkins 1912 was expected to give Colbath of Bowdoin a battle for first place in the two-mile run. Colbath had won first in the mile run about three-quarters of an hour before this and his followers feared that he would be unable to make the premier place in the long distance event. Watkins lead the field for six laps. The other Tech runners, the Ferry brothers, were out of the contest after the half mile had been passed. Colbath was directly behind Watkins with Greene of Brown at his shoulder. On the sixth lap, Colbath attempted to pass Watkins but Watkins fought back hard and retained his place but toward the last half of the final lap, Colbath with tremendous speed and power, forced Watkins to give up his place. Colbath came down the finish with fine style and broke the tape 9 min. 56 1-5 seconds after the start. Watkins was easily second with Greene of Brown third, and Simson of Williams fourth.

HURDLES.

Fish of Williams, Wendell of Wesleyan, Marble of Brown, and Pead of Tech made up a fast quartette in the high hurdles. Wendell got away in good shape and by clearing his hurdles better than the other contestants he made better time, finishing first in 16 2-5 seconds. Fish of Williams just managed to place ahead of Pead and Marble came in fourth.

After the semi-finals in the low hurdles, there was left for the final race. Edwards of Bowdoin, Gutterman of Vermont, Roberts of Amherst and Marble of Brown. Roberts and Gutterman lead up to the last hurdle while Edwards of Bowdoin was a few feet hehind. On the dash for the tape, Edward pulled ahead and won the event by inches from Roberts. Gutterman was third and Marble fourth. The time was 25 3-5 seconds.

FIELD EVENTS.

But for the work of Holdman in the pole vault and the jumping of Gutterman, the Vermont star, the field events were without any special f eatures. Clough of Worcester Polytech proved the winner in the shotput and Bowdoin took the most points in the hammer throw from Dartmouth who expected that the Marden brothers would place high. By beating Chamberlain of Tech by about three inches in the discus, Lovejoy of Dartmouth gave the Green the point needed to throw the victory from Bowdoin to the Hanover college.

The summary for both days:—

100-YARD DASH.

First heat—Won by E. M. Roberts, Amherst; J. H. McKenney, Bowdoin, second. Time 10 2-5s.

Second heat—Won by E. Baldwin. Amherst; J. S. Russell, Dartmouth, second. Time 10 2-5s.

Third heat—Won by R. V. Snow, Williams; J. R. Pinkett, Amherst, second. Time 10 2-5 se.

Fourth heat—Won by W. E. Robson, Wesleyan; J. P. Hartigan, Brown, second. Time 10 2-5 s.

Heat for second men—Won by J. S. Russell, Dartmouth; J. H. McKenney, Bowdoin, second. Time 10 3-5s.

Final heat—Won by E. M. Roberts, Amherst; W. E. Robson, Wesleyan, second; E. Baldwin, Amherst, third; J. S. Russell, Dartmouth, fourth. Tome 10 2-5s.

220-YARD DASH.

First heat—Won by Salisbury, Tech; Russlel, Dartmouth, second. Time 23s.

Second heat—Won by Baldwin, Amherst; Wood, Wesleyan, second. Time 22 4-5s.

Third heat—Won by Robson, Wesleyan; Hartigan, Brown, second. Time 23s.

Final heat—Won by W. E. Robson, Wesleyan; W. C. Salisbury, second; L. R. Woodfi Wesleyan, third; E. Baldwn, Amherst, fouth, Time 22 4-5s.

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THE INSTITUTE TRAINING

(Continued from page 81.)

rifice of learning the principles in class or lecture room, ior the doubtfull advantages of more detailed information. As President Walker said, engineers should be "strengthened by the mastery of principles, more than by the acquisition of information, with temperaments chastened to the true union of conservatism and enterprise by study of the best examples from practice."

From now on the courses divide. The "professional" work is emphasized. Now it is that the individuality of the man is developed. After having been given the principles he is left to his own devices in their application in the class room. The responsibility is put right up to the man and he must develop the nerve to go ahead with the courage of his convictions.

One of the most notable things about the professional work at the Institute is that it cannot be characterized as boy's work with toy miniatures. Instead of that, life size realities are at the disposal of the student. The full sized brick arch experiments are illustrations of this point. Conditions are made as much like those found in the world as they can be within the limitations of space and circumstance.

Still the importance of the principle over the detail must be emphasized. President Walker said the Institute trains by "subordinating the acquisition of the knacks of a trade and mere technical device sto the study of principles." This study is largely confined to the recitation or lecture room and is, wherever possible, made to precede the laboratory.

The final accomplishment of the training at the Institute as outlined above is not that engineers or architects or scientists will be turned out but that men will be started on the road toward becoming engineers, architects or scientists. The students are trained in the broad principles. The Institute recognizes that its graduates have but begun their work. To become worthy of the name, to be recognizd by the professions as really worthy to bear the title, is the crowning achievement of years of earnest ndavor and self-sacrificing study. The four or five years spent here serve but to start the man upon his career. He is given the proper attitude towards his profession; he is made familiar with the great principles of art and science which are to become the foundation of his professional knowledge and development. He is given facility in the processes that he must use in the expression of his imagination and his thoughts, and is familiarized with the sciences and their applications by which his creations will be made realities. He is taught the logic and reasonableness of all true endeavor, and his taste, his powers of discrimination between good and bad are developed.

This is the ideal toward which the Institute aims. Its success depends much upon the attitude of the student. It is a process not only of instruction but of development; and not only of imparting knowledge but of education in its broadest sense.

COLLEGE PAPER MEN MEET

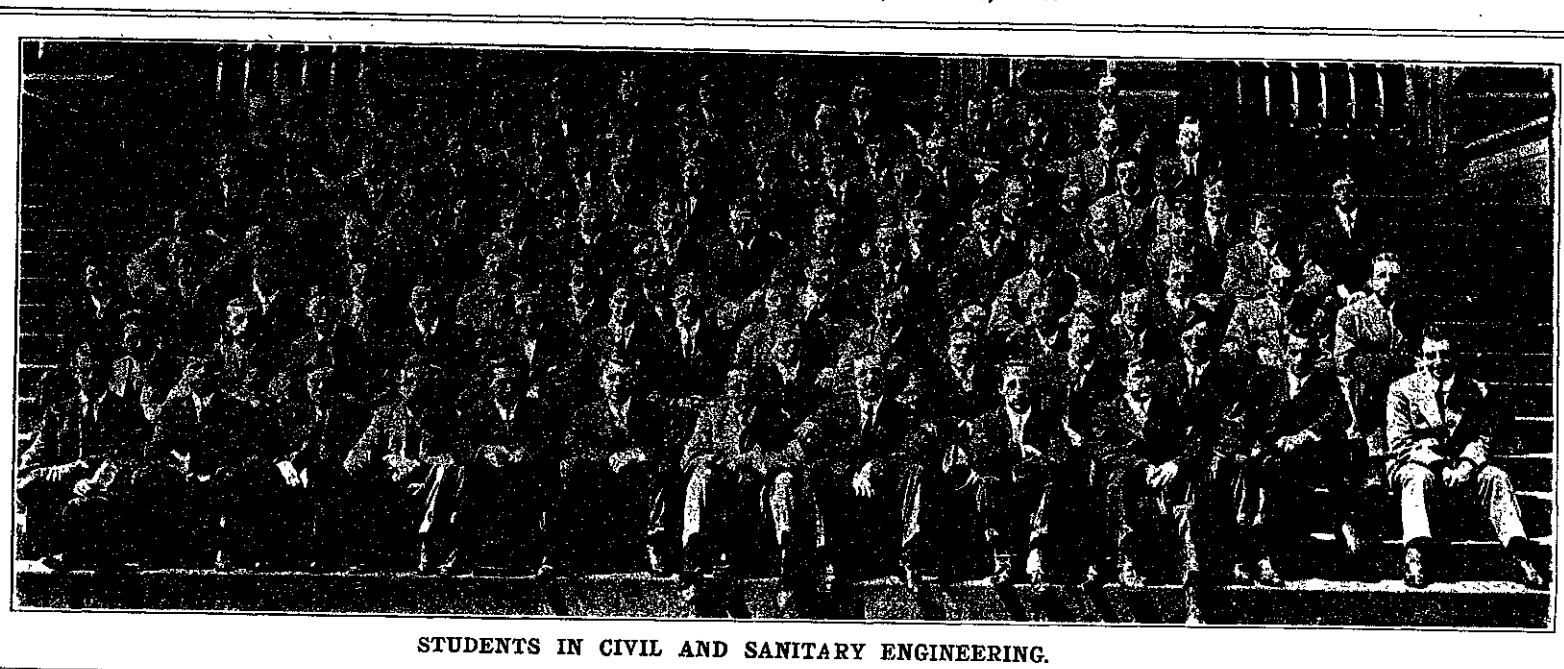
Last Friday at 11 A. M., representatives from ten New England College papers met at the Hotel Westminster. The price of issues, circulation, alumni notes, general news, dramatic criticisms, the editorial page, and methods of Board elections were all discussed and notes compared. After this discussion, the representatives adjourned to lunch, where the officers for the coming year were elected as follows: R. H. Ranger, M. I. T., president; Miss Kelly, Wellesley, vice-president; Mr. George, Amherst, secretary-treasurer.

The Tech was representer D. N. Frazier and R. H. Ranger.

CAMP OSSIAUKEE.

Mr. Gideon and Mr. Breed of the Drawing Dept. announce the second season of their summer camp for boys on Lake Winnipesaukee, N. H.

Besides the usual camp sports, several forms of manual training and drawing are taught—the boys being required to engage in some occupation for about two hours each morning. Considerable attention is given to nature study. Each department of the camp is in charge of an expert.



STUDENTS IN CIVIL AND SANITARY ENGINEERING.

CO. B WINS PRIZE

Amid the applause of the largest audience at a Tech Prize Drill for years, Captain Louis R. Golden carried off the honors for company drill last Friday night. The competition for the individual prizes was very close. First prize was won by Sergeant E. W. Taft of Co. A, second prize by Sergeant K. D. Hamilton, of Co. C. The whole drill was one of the most successful and best ever held. The judges were Major John Bigelow, Jr., U. S. A., Capt. Frank I. Long, U. S. A., and Capt. Philip Yost, U. S. A.

At eight o'clock the battalion was assembled under command of Major John A. Herlihy and the ceremony of battalion inspection and review by President Richard C. Maclaurin and Captain Alpha I. Easton, professor of military science, was held. Then the battalion broke ranks and Company A, Capt. F. H. Bushby, marched on the floor, the first to go through the company drill. They were followed by Company B.

The first squad of twenty-four men in the indvidual drill had the floor next, under command of Lieut. E. W. Davis, and after about twenty minutes of drill was cut down by the judges to six. The squad of six drilled under command of Lieut. H. M. Priest. The winners were not announced until later in the evening. Company C, Capt. H. L. Tirrell, and Co. D, Capt. W. W. Lang, then went through their company drill.

The battalion was formed at once after Company D finished its drill, and went through the ceremony of battalion parade. The prizes were then awarded by President Maclaurin, who pinned the medals on the breasts of the winners. The battalion then passed in review and the ceremonies were over.

All four companies put up an excellent drill, and the spirit shown was fine. The prize was in doubt until the last minute. After the rather poor and careless spirit which at times characterized the drill during the present year the fine work at prize drill came as a pleasant surprise to all those interested in the military affairs of Technology.

AID GIVEN STUDENTS OUTSIDE OF CLASS ROOM

Advisory, Recreation, Employment, Boarding and Rooming Departments

By M. R. SCHARFF

Although there is no set of rules at Technology governing the actions of students, and though the Faculty practically never interferes in any way with the student activities, still no one can say that the Institute does not take a keen interest in student affairs and in the social life of the students. From the time he enters until his graduation, the student cannot but be impressed with the keen sympathy with him and his affairs existing in Faculty, Corporation, and Alumni alike.

, At the center of the Institute's system of student guardianship is the Dean. He is the general consulting officer, and in his office a student is always sure to find a sympathetic listener, a wise counselor, and a friend.

To co-operate with the Dean in giving the students the advantage of friendly advice, to every new man is assigned some member of the instructing staff to act during the first month as advisor. After the first month students are thrown into close personal contact with instructors in English and Mathematics by a system of individual conferences, and these take the place of the advisors first appointed.

The health of the students is supervised by a competent physician as Medical Adviser. He may be consulted free of charge on two days every week, and delivers during each year several helpful talks on personal hygiene.

In order to help new students get located, a list of rooms suitable for students is kept by the President's Assistant. This list is investigated annually by the Technology Christian Association, and copies are distributed to all who wish them.

The President's Assistant also conducts an Employment Bureau, for the purpose of helping needy students earn part of their expenses during summer vacations, or in spare time during the term.

The interest of the Institute in student activities has been most strikingly shown by the construction of the Technology Union. This building was erected on Institute land with funds raised by members of the Corporation and interested Alumni, through the activity of the Committee of the Corporation on Student Welfare. The Union contains a dining room, where meals are served at minimum prices, a large smoking room, a writing room, small dining room, check room and post office, toilets, offices for student organizations, etc., etc. Although it is hoped this venture may prove self-supporting, it has not yet reached that condition, and the Institute has assumed the entire financial responsibility.

The Alumni Association also has a Committee on Student Welfare which co-operates with the Corporation Committee and with the students. It has shown itself always ready to assist worthy student activities by advising, or by raising funds.

The interest of the Institute authorities in Athletics is substantially shown by an annual appropriation for the maintenance of the Athletic Field, by the Alumni Advisory Council which has so ably administered athletic affairs for many years, and by contributions of Alumni and Corporation members to the support of athletics. The Cabot Medals awarded annually for improvement in physical development are also intended to encourage beneficial exercise.

In addition, a hundred minor ways might be cited in which the Institute authorities have displayed their interest in the students. The construction of Bulletin Boards for student notices, the allowance of a half-holiday on the annual Field Day, and the willingness at all times to consider the students' wishes in decisions affecting them by the Faculty, Corporation, or Alumni, are but a few examples; but they serve to show that the Institute does look after the welfare of its students, and that the students can count on its continued sympathy and co-operation.

N. E. I. A. A. MEET

(Continued from page 84.)

224-YAR DRUN.

First heat—Won by Lester, Willams; Salicbruy, Tech, second. Time 52s.

Second heat—Won by McKenna, Holy Cross; Augevine, Willams, second. Time 52 3-5s.

Fourth heat—Won by Young, Amherst; Wood, Wesleyan, second. Time 51 4-5s.

Final heat—Won by D. B. Young Amherst; J. D. Lester, Williams, second; L. R. Wood, Wesleyan, third; W. C. Salisbury, Technology, fourth. Time 51s.

880-YARD RUN.

First heat—Won by White, Tech; Baxter, Dartmouth, second; Walker, Maine, third; Harmon, Maine, fourth. Time 2m. 6s.

Second heat—Won by Cates, Colby; Holmes, Dartmouth, second; Fortier, Maine, third; Campbell, Williams, fourth. Time 2m 5 4-5s.

Final heat—Won by C. B. Baxter, Dartmouth; P. D. White, Technology, second; F. E. Fortier, Maine, third; R. D. Campbell, Williams, fourth. Time 2m 1 3-5s. (Track record.)

MILE RUN.

Won by H. J. Colbath, Bowdoin; P. Harmon, Maine, second; W. M. Hicks, Maine, third; F. I. Newton, Williams, fourth. Time 4m 27 3-5 s. (Track record.)

TWO-MILE RUN.

Won by H. J. Colbath, Bowdoin; H. G. Watkins, Technology, second; W. W. Greene, Brown, third; G. F. Williams, fourth. Time 9m 56 1-5s. (Track record.)

120-YARD HIGH HURDLES.

First heat—Won by Pead, Tech; Marble, Brown, second. Time 16 3-5s.

Second heat—Won by Wendell, Wesleyan; Grant, Tech, second. Time 16 2-5s.

Third heat—Won by Fish, Williams; Gutterson, Vermont, second. Time 16 2-5s.

Heat for second men—Won by Marble, Brown. Time 17s.

Final heat—Won by J. F. Wendell, Welseyan; L. D. Fish, Williams, second; W. J. Pead, Jr., Technology,

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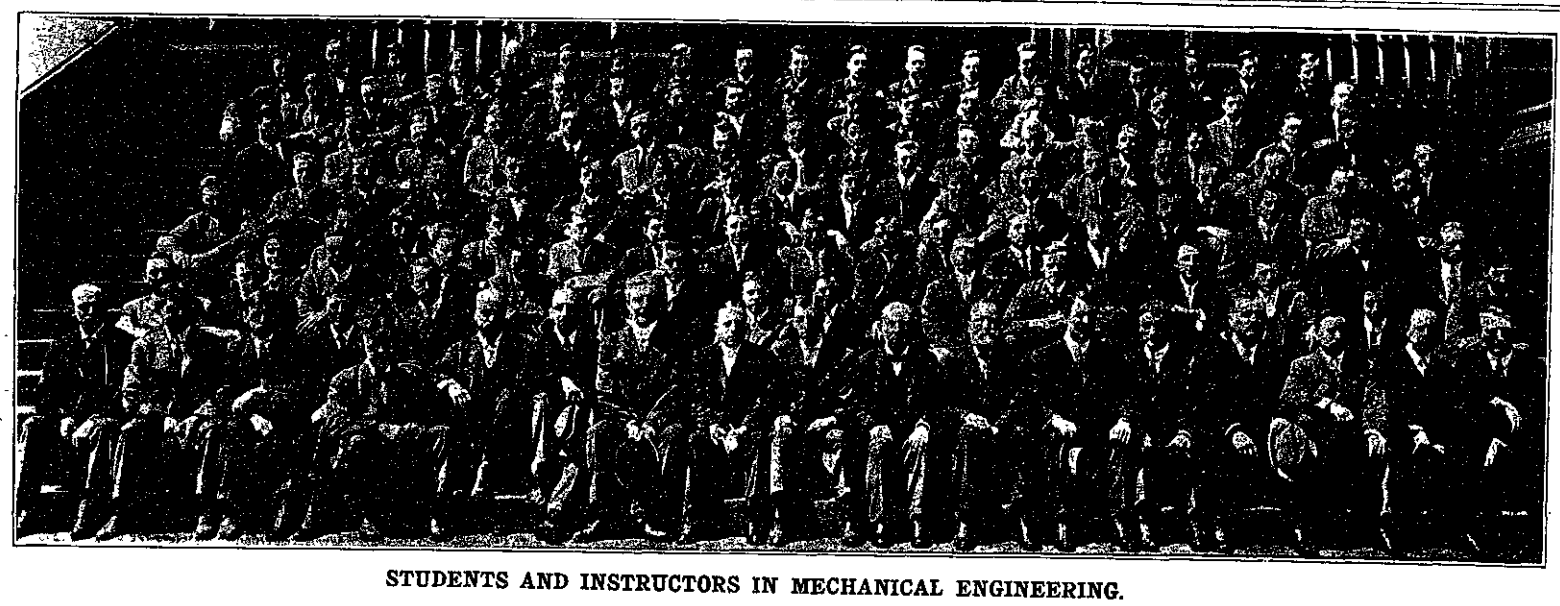


STUDENTS AND INSTRUCTORS IN MECHANICAL ENGINEERING.

PRACTICAL CHARACTER OF THE LIBRARIES

By DR. R. P. BIGELOW

Libraries are established for the two-fold purpose of culture and information. Culture has been defined by President Woodrow Wilson as, "The intimate and sensitive appreciation of moral, intellectual, and aesthetic values."

As a means of culture at the Institute may be mentioned first the collection of books on English literature to be found in the General Library. This includes sets of the principal classical works in the language and many other works of interest and value.

For the appreciation of intellectual and moral values, the study of history and biography is important. Books of this character are found also in the General Library, together with a number of interesting books of travel. Considerable importance should be attributed also to the current literature as found in the best periodicals published in this country and abroad. A good collection of these will be found upon the periodical shelves in the General Library where they are easy of access to all students.

Tis includes, not only periodicals published in the English language, but also several in French, German, Italian, and Spanish. When one has completed a course of instruction in a foreign language, and then has no occasion to use it for some time, one finds when it becomes necessary to use it in professional work, that his knowledge of the subject has become very rusty. To prevent this, frequent reading of books or periodicals in foreign languages is desirable, and means are provided for this in the General Library. A more extensive collection of works n French and German literature will be found in the Library of Modern Languages in Room 20, Lowell.

While there are some books on Art and Aesthetics in the General Library, most of the material on this subject is to be found in the Architectural Library, 30 Pierce Building. Here is brought together a really fine collection of books in Architecture and Art, and the history of these subjects. These books, of course, are primarily for the use of the students in Course IV but others may find here much of interest.

Books on social questions, government, and the history of the United States are kept in the Library of History and Economics, Room 40, Rogers. These will be of special value to any one who is interested in the relations of man with his fellow beings and the problems which are created by the association of persons into states and municipalities.

Wide and accurate information is an essential basts for the appreciation of moral and intellectual values, as it is for professional attainment. The greater part of the Libraries of the Institute is devoted to information.

One desiring to know something of any particular subject will naturally seek books in the Library of the Department which has to do with that particular subject; for example, in the Engineering Library, Room 40, Engineering A, books are to be found on Civil, Sanitary, and Mechanical Engineering; books on Electrical Engineering are to be found in the Library of the Electrical Engineering Department, 3 Lowell; books of Chemistry in the Chemical Library, etc. But there are other subjects with which our books deal, which are not indicated by the names of the Library; for example,—there is being formed a collection of books on Aeronautics in the Library of Naval Architecture; Radiotelegraphy and Radiotelaphony are treated by books to be found in the Physical Library, and if one were interested in Forestry, the place to find books on this subject is not the Biological Department, but the Engineering Library.

If any one is in doubt as to where to look for boooks on any particular subject, there is one central source of information which is not used as much as it might be, and that is the catalogue in the General Library. This is a general catalogue of all the books in the Libraries of the Institute, and from it may be obtained information as to the location of any particular book or books on various subjects. During office hours, there is always a Library Assistant at the desk who is glad to answer questions or to help any one to obtain information.

One of the most difficult things in connection with the use of the Libraries is to find the information which is contained in the periodicals. This, of course, is not to be obtained from the Library catalogues, but must be sought in other sources. Fortunately, these are plentiful.

For engineering subjects, we have the "Engineering Index," both monthly, annual, and combined in five-year volumes; the "Repertorium der Technischen Journal-Literatur," annual publication of the German Patent Office, which, in spite of its source and title, is perfectly easy to use by any one, though not familiar with the German language.

In the pure sciences and their applications we have the "International Catalogue of Scientific Literature" and many Jahresberichts and Zentralblatts too numerous to mention. Here again one unfamiliar wth German should not be discouraged wth the titles on the backs of the books.

In this connection may be mentioned a number of similar sources of information which are kept in the General Library. "The Readers' Guide to Periodical Literature" covers a wide range of periodicals, some of which border on the professional and many of which contain references to scientific and technical subjects. Then there is the "Bibliographie der Deutschen Zeitschiften-Literature" which gives very complete references to an incredible number of German periodicals and newspapers. The technical subjects of more popular interest, as for example,—Water Supply, Sewerage, Electricity, Aeronautics, etc., will be found to be covered by very numerous references.

In closing it might be well to say a word in regard to the use of the catalogue. As most members of the Institute are aware, the books are arranged according to system of classification by subjects, the numbers on the banks of the books indicating their place on the shelves. The principal entry for every book, except periodical, is made in the catalogue under the name of the author. It is, therefore, always best in looking for the book to look for the name of the author in the catalogue. It this is unknown, then look under the subject. In some cases the exact titles of books are given. In this case, the entry may be found by looking under the first word of the title; but in most of the Departments, there are few of the books, except the periodicals and annual publications, which are entered under the first word of the tittle.

Another point that may be mentioned is that in the General Library there is a place set aside for the works of officers and graduates of t the Institute, which is sadly incomplete, owing no doubt, to the fact that few know of its existence. The Librarian will be pleased to eccept and record any contributions of original works received from those who have graduted from the Institute, and these, if properly kept,, would form an interesting and valuable collection.

PROSPECT AND STATUS OF INSTITUTE ATHLETICS

Continued from page 81.

is now existing. The greater the interest taken in under-graduate competition, the more successful will we also be in "Varsity" lines.

The only sport for exercise which might be newly undertaken at the Institute is Hand Ball, and the Advisory Council are now considering this matter and hope to see its way clear to put up at least one or two courts.

The matter of compulsory gymnasium work has certainly accomplished good results and a closer affiliation between the gymnastic and athletic work would, I think, create more interest on the part of participants. From what I have learned from observation and also from reports of the gymnastic instructors, there is an absolute necessity that instruction to young men entering the Institute be given, particularly as to their physical health and welfare.

THE ORGANIZATION OF THE INSTITUTE

Continued from page 81.

The first three of these groups, with the President, constitute the Faculty, and its members are usually recruited by promotion of the junior teachers. The Faculty chooses its own officers—Chairman, Dean and Secretary—and makes its own rules. It is directly responsible for the curriculum and scholastic standards. Of the 90 members 54 are at present Technology alumni. Unlike the Corporation and the Executive Committee, the Faculty has no charter or authoratative definition of its powers and duties, these being defined, if at all, only by presedent and tradition. The moral weight which attaches to its decisions on all questions of educational policy is nevertherless very great, and its recommendations in regard to conferring the degrees of the Institute are invariably adopted by the Corporation. The President, as the presiding officer of both bodies, constitutes their official connection with each other.

With the increasing size of the Faculty it has become necessary to relegate as much of its business as possible to standing and special committees, and to the administrative officers whose duties are defined in the Faculty Rules. In comparison with other institutions it is note-worthy that universities as large as the Institute are ordinarily composed of several main divisions, often called colleges or schools, as of law, engineering, liberal arts, etc., each with a dean as its administrative head. The Institute not being thus divided, the office of dean has a distinct significance connecting itself mainly with matters of discipline, which are fortunately few and simple at the Institute, and with the very important personal relations with individual students, particularly in the first year.

Of the standing committees, the most important are perhaps those on Faculty Business on Advance Degrees and Fellowships, on the Conduct of Examinations, on Courses of Instruction, on Entrance Examinations, on Petitions, on Publications, on the Tabular View and Room Scheme, on Undergraduate Scholarships, and the three committees dealing with records of first, second and third-year students respectively. The chairmanship of any one of these committees carries with it considerable responsibility, and in many cases a large expenditure of time.

The educational function of the Faculty as a body is essentially one of coordination, actual teaching being necessarily in charge of individuals, grouped for the purpose in departments, professional or general. The Faculty and its officers and committees deal thus with matters of interdepartmental character, regulating, for example, the time which may be allotted for any professional course, and passing on all questions of redistribution.

The departments, as enumerated in the catalogue, number twenty, besides the research laboratories, but they vary widely not alone in subject matter but in size, development and organization. The largest numerically is Chemistry, with thirty-five persons on its permanent staff. At the other extreme, Military Science has but one; Physical Training, two besides the Dean.

As has been said of the Faculty, the departments have no authoritative definition of their powers and duties; they are subject to restriction or direction on the one hand by the Executive Committee of the Corporation through appointments and appropriations; on the other hand, by the Faculty and administrative officers in connection with the application of Faculty rules. Within the department, organization may be formal, or informal, democratic or otherwise, according to size and other conditions. In general the head of the department is responsible to the corporation for making recommendations in regard to nominations, promotions, etc.

Of the alumni and the undergraduates and their organizations important as these are to the Insitute it is not the purpose of this article to speak.

GENERAL USEFULNESS OF INDUSTRIAL CHEMISTRY

By PROF. W. H. WALKER

In the fall of 1907, the Institute established what is called a Research Laboratory of Applied Chemistry. But in the minds of many the terms "research" and "applied chemistry" present a paradox. How can there be any research involved in simply applying principles of chemistry already well understood? In order to get clearly in mind the functions of such a Liboratory, and the relation which it bears to the community, it will be necessary to inquire as to what research in applied chemistry involves, and how it differs, if at all, from research in any other field of chemistry.

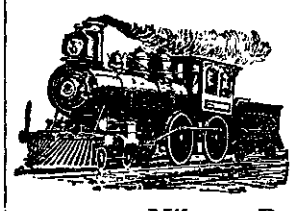
If one may use a rough analogy, original or research work in chemistry may be compared to an exploration into an undeveloped country. The explorer will be guided by certain well-known land marks, but he will eventually come to a river which has never been crossed,—a problem which has not been solved. Research consists in building a bridge across this river over which any one may subsequently pass. Original work in applied chemistry does not consist, therefore in simply using the bridges constructed by others in traveling towards a definite goal, but necessitates the construction of many difficult bridges over rivers never before crossed.

Research in applied chemistry differs from research in what for want of a better term we call theoretical chemistry, however, in at least this particular:—in the case of theoretical chemistry, a bridge is built largely, if not entirely, because the builder elects to build it in a particular place, at a particular time, but without reference as to whether the bridge will be used by others in the immediate, or even in the remote future. In applied chemistry, on the other hand, the bridge is built because there is a demand for the bridge, and because when finished it will be immediately utilized. The bridges are built in the same way, by the same general methods, and with the same materials of construction. They differ fundamentally only in this one particular, namely, that the research worker in applied chemistry builds for immediate utilization, while the research worker in theoretical chemistry builds fo the future, whether it be immediate or remote.

Nor are the bridges which are most worth building in applied chemistry more easy of construction, or demand less application of true scientific spirit, nor are they less enjoyable in their building than those in others fields of chemistry. Because the bridge is to be utilized immediately upon its completion does not make it less worthy of building than one for which there is at present no apparent demand.

The Research Laboratory of Applied Chemistry was established by the Institute therefore, with two main objects in view. The first to attack some of the problems in chemistry for the solution of which there is at present an insistent demand, and second to provide a laboratory where the problems incident to the process and plant of individual manufacturers not possessed of adequate facilities can be investigated. Both of these lines of work are at present carrid on with a degree of success which would seem to have justified the establishment of the Laboratory. The work on the corrosion of iron and steel which has been done, and the methods of protecting steel structures by means of paint and other coverings, has attracted the active co-operation of two of the standing committee of the American Society for Testing Materials, and the aid of the Scientific Section of the American Paint Manufacturers' Association. A study of the principles underlying fractional distillation and their application to a differential condenser has obtained the support of certain large manufacturers and users of distillation apparatus.

Individual corporations have been sufficiently eager to take advantage of the facilities offered by the Laboratory for a study of some of their more important problems, to already overtax the available laboratory space. That there is a demand for such a Laboratory is beyond question, and that this demand is in some measure met is apparent from the ease with which the interest of manufacturing concerns has been enlisted.



RESEARCHES IN PHYSICS DEPARTMENT

By PROF. H. F. GOODWIN.

A number of researches are at present in progress in the department of Physics, some of them being purely scientific in character, and others having a technical bearing.

In the Laboratory of Heat Measurements Professor Norton is carrying on a number of researches on the heat properties of various materials, which are of great technical interest and value. Among these may be mentioned the investigations of Mr. K. D. Stellwagen on the Protection of Steam Heated Surfaces, of Mr. W. W. King and Mr. Philip Hart on the Thermal Sonductivity and Fire Resistance of Cinder Concrete, and of Mr. J. T. Whitney on the Condensation of Moisture through Concrete Walls.

Mr. Stellwagen's thesis is an extension of the work carried on for a number of years in the Laboratory of Heat Measurements. The increasing use of high temperature steam having made it necessary to extend the older observations to cover higher temperature ranges, some new and original methods have been adopted which have greatly improved the precision of the measurements.

The thesis of Mr. King and Mr. Hart deals with the problem of protecting steel from fire risk, and sheds considerable light on the question as to whether the presence of unburned coal in small quantities is a fatal objection to cinder concrete from a fire proofing standpoint.

The thesis of Mr. Whitney is undertaken to determine the necessary thickness of concrete walls of varying compositions to insure dryness on the inside of the wall. As is well known one of the difficulties with many concrete houses has been the dampness of the interiors and the condensation of moisture upon the inner sides of the house walls. It is sought in this thesis to establish some relation between the thickness of such walls and the amount of condensation.

In the Laboratory of Electrochemistry Professor Goodwin and Mr. Read are investigating the electrical properties of subtances over wide ranges of temperature. Graphite and carbon are being at present studied and it is hoped to extend the work to metals both in the liquid, as well as the solid state. In addition to their practical importance, such data are much desired at the present time in connection with the modern theories of the nature of metallic conduction. Mr. Maxfield has been making a study of the performance of the new induction furnace for the production of steel, alloys, etc., which has been recently installed in the laboratory. It is roped to continue the work of this thesis next year to other uses of the induction furnace.

Professor Thompson has been engaged for some time on a series of investigations on high temperature equilibria. He has recently brought to a conclusion and published his results on the equilibrium of the system calcium carbide, ime, carbon and carbon monoxide. At present he and Mr. Lombard are studying the equilibrium of the system cyanamide, nitrogen, carbon and calcium carbide, the reaction nvolved being one of great technical importance in the problem of the fixation of atmospheric nitrogen.

Two other researches recently completed and published from this laboratory are,—The Seperation of Oil from Condenser Water by Electrolysis by Professor Goodwin and Mr. Ellis, and —The Electrolysis and Conductivity of Cuprous Chloride Solutions by Professor Thompson and Mr. Hamilton.

Professor Derr has, during the past year, continued his investigations in color photography, and has added to the Department collection a number of photographs illustrating the latest English and French prosesses.

Dr. Comstock is engaged on an important research in theoretical physics the results of which are awaited with much interest. The nature of the problem under investigation is outlined below.

In the modern theory of light a question of fundamental importance is "does the velocity of light depend upon the motion of the source, that is, if a source of light is moving rapidly toward the observer does the light reach him in a shorter time than if the source were stationary?" It is now generally believed, and, in fact, the modern theory of light in its othodox form almost requires that the motion of the source makes no difference in the velocity, but the question has never been dealt with in a proper way experimentally, and if answered affirmatively it would have a profound influence in modifying not only optical but also electromagnetic theory. There seems to be no easy terrestrial method of answering the question, but by the careful observation of the motions of double stars in their orbits, it seems possible to get definite data on the subject. A little thought will show that if the velocity of light does depend upon the motion of the source, we, on the earth, will see a revolving star relatively sooner in its approaching positions than in its receding positions for the light comes to us faster from the former than it does from the latter. The apparent motion will, therefore, be timed differently than the real motion and knowing the real motion from the law of gravitation we may hope thus to detect any deviation due to this cause.

This is now being done, but it involves the careful analysis of the results of many observations on double star orbits and consequently requires some time. A preliminary report will be published shortly.

An experimental investigation is also being carried on by Dr. Comstock and Mr. Washburn to test the electron theory of magnetism. It is hoped to show that the paramagnetic metals like iron are also diamagnetic. The difficulties of the investigation are first in getting rid of the large paramagntetic effect so that the smaller diamagnetic effect, if it exists, may show itself, and second in obtaining instruments sensitive enough to detect, or perhaps measure, the diamagnetic effect. These difficulties seem now in a fair way to be overcome and it may soon be definitely asserted that within the range of the experiments the electron theory is or is not verified.

Dr. Kalmus and Mr. Faxon are engaged upon an investigation of the effect of tension on the resistance ot certain metals, such as nickel, copper, iron and German silver. Some very interesting results have been obtained, particularly with nickel which shows an anomalous behavior under tension.

H. M. GOODWIN.

NOTICES

The dinner for Company B will take place tonight at 6.30 P. M. at the card room in the Union.

Meeting of all members Aero Club 4.15, Tuesday, Union. Election of next year's officers.

GREAT CHANCE.

Those wishing photographs which appeared in Technique communicate with K. W. Faunce. Team pictures, 50 cents; individual, 25 cents.

LECTURES BY MR. BARNABY.

Lectures will be given by Mr. Sidney W. Barnaby at 4.00 P. M. in Room 11 Engineering Building B on the 10th, 12th, 16th, 18th and 20th, to students of the Department of Naval Architecture and Marine Engineering. Students of other Departments are also cordially invited to attend.

C. H. PEABODY.

FOR SALE—Two 17-foot canoes for sale, in the best of condition. See Frazier or Fitzherbert, in The Tech office.

N. E. I. A. MEET

(Continued from page 85.)

third; W. H. Marble, Brown, fourth. Time 16 2-5s.

220-YARD LOW HURDLES.

First heat—Won by Gutterson, Vermont; Bacon, Wesleyan, second. Time 26s.

Second heat—Won by Roberts, Amherst; Edwards, Bowdoin, second. Time 26 2-5s.

Third heat—Won by Marble, Brown; Smith, Dartmouth, second. Time 26 4-5s.

First semi-final heat—Won by S. Edwards, Bowdoin; A. L. Gutterson, Vermont, second. Time 25 3-5s.

Second semi-final heat—Won by E. M. Roberts, Amherst; W. H. Marble, Brown, second. Time 26 3-5s.

Final heat—Won by S. Edwards, Bowdoin; E. M. Roberts, Amherst, second; A. L. Gutterson, Vermont, third; A. H. Marble, Brown, fourth. Time 25 3-5s.

HIGH JUMP.

Won by E. R. Palmer, Dartmouth, 5 ft. 11 in.; R. D. Ely, Williams, second, 5 ft. 10 in.; Thomas, Dartmouth; Herrick, Colby; Burlingame, Bowdoin, and McKay, Brown, tied for third at 5 ft. 7 in. McKay won the toss for third prize.

BROAD JUMP.

Won by A. L. Gutterson, Vermont, 23 ft. 1 in.; E. M. Roberts, Amherst, second, 22 ft. 5 in.; L. McFarland, Bowdoin, third, 21 ft. 2 1-2 in.; J. Marks, Dartmouth, fourth, 21 ft. 1 3-4 in.

POLE VAULT.

Won by O. 7. Holdman, Dartmouth, 11 ft. 8 1-2 in. (record); C. H. Jenks, Dartmouth, second,, 11 ft. 4 in.; A. R. Wessells, Trinity, third, 11 ft; D. N. Mles, Amherst, C. Deming, Bowdoin, and S. A. Herrick, Colby, tied for fourth at 10 ft 6 in.

SHOTPUT.

Won by C. C. Clough, W. P. I., 40 ft 11 1-2 in; G. Mason, Williams, second, 40 ft 11 in; C. W. Tobin, Dartmouth, third, 40 ft 3-4 in; J. H. Parkinson, Wesleyan, fourth, 39 ft 9 in.

HAMMER THROW.

Won by M. E. Warren, Bowdoin, 130 ft 5 in; J. L. Crosby, Bowdon, second, 127 ft 2 in; W. W. Marden, Dartmouth, third. 125 ft 1 in; G. C. Lewis, Dartmouth, fourth, 121 ft 7 1-2 in.

DISCUS THROW.

Won by J. H. Parkinson, Wesleyan, 115 ft; J. E. Douglas, Tufts, second, 114 ft 9 1-4 in; J. S. Thomas, Willams, third, 110 ft 6 in; L. E. Lovejoy, Dartmouth, fourth, 110 ft 4 in.